Piston for an internal combustion engine

The invention relates to a piston for an internal combustion engine, in accordance with the preamble of claim 1.

An aluminum piston for an internal combustion engine, having a ring element made of Ni resist disposed in the outer region of the piston head, which ring element forms the reinforcement for the groove of a compression ring, is known from the Japanese patent document JP 06002613. In order to securely fix the ring element in place on an aluminum basic body, it is necessary to attach it on the basic body by means of the friction welding method. A disadvantage in this connection is that this attachment method is relatively complicated.

It is the task of the invention to avoid this disadvantage of the prior art. This task is accomplished with the characteristics that stand in the characterizing part of the main claim. Practical embodiments of the invention are the object of the dependent claims.

In this way, the advantage is achieved of being able to provide an aluminum piston with a ring groove reinforcement that can withstand mechanical stress, in quick, simple, and reliable manner.

An exemplary embodiment of the invention is described below, using the drawings. These show:

Fig. 1 a piston for an internal combustion engine, having an Ni resist ring element according to the invention, in a sectional drawing consisting of two halves, which drawing shows two longitudinal sections of the piston, offset by 90°, and

Fig. 2 an enlarged representation of the section through the edge region of the piston head with the Ni resist ring element.

Fig. 1 shows a piston 1 for an internal combustion engine, in a sectional representation that consists of two halves, of which the left half shows a section of the piston 1 along a longitudinal axis 5 of a pin bore 6, and the right half shows a section through the piston 1 that is offset by 90° relative to the left half.

The piston 1 consists of an essentially cylindrical basic body 2, which has a piston head 3 in whose radially outer edge region a ring element 4 is disposed, by which the radially outer part of the piston head 3 is formed. A combustion chamber 7 is molded into the central region of the piston head 3. Furthermore, the basic body 2 has pin bosses 8 for the pin bores 6 and skirt elements 9 that connect the pin bosses 8 with one another, on its lower side that faces away from the piston head 3. The ring element 4 has a groove 11 for a compression ring, not shown in the

figure, on its radially outer mantle surface 10, and forms the radially outer part of the upper groove wall of a second ring groove 13 with its lower face 12. Below the second ring groove 13, the radially outer mantle surface 14 of the basic body 2 has an oil ring groove 15.

A collar 16 is molded onto the region of the ring element 4 that lies on the piston head side, which collar has a ring surface 17 on its lower side that faces away from the piston head 3, which surface lies parallel to the piston head 3 in the present exemplary embodiment, but can also lie at a slant to the piston head 3 in cross-section, so that the ring surface 17 has a conical shape. A recess 18 is molded into the radially outer region of the piston head 3, which recess is step-shaped in cross-section, and has a shape that is complementary to the collar 16, in such a manner that the collar 16 fits into the recess 18 and additionally, a ring-shaped sealing element 19 configured in the manner of a plate spring can be introduced between the ring surface 17 and the recess 18.

Below the ring surface 17, the ring element 4 has a recess 20 on its inside, which forms a ring-shaped cooling channel 22 with a recess 21 that is worked into the outside of the basic body 2, close to the piston head 3. Cooling oil is passed out of the cooling channel 22 by way of an oil channel 24 that connects the piston interior 23 with the cooling channel 22, which oil is

introduced into the cooling channel 22 by way of another oil channel, not shown in the figure. In this connection, the sealing element 19 has the task of sealing the piston 1 with regard to combustion gases.

An inside thread 25 disposed on the inside of the ring element 4, close to the lower face 12, which fits onto an outside thread 26 affixed onto the mantle surface 14 close to the second ring groove 13, serve to attach the ring element 4 on the basic body 2. In order to give the screw connection between the basic body 2 and the ring element 4, which connection consists of the inside thread 25 and the outside thread 26, sufficient strength for engine operation, the ring element 4 has a ring-shaped contact surface 27 that is disposed between the inside thread 25 and the recess 20, and lies parallel to the piston head 3, which surface comes to rest on a ring-shaped contact surface 28 that also lies parallel to the piston head 3, and is disposed between the recess 21 and the outside thread 26 of the basic body 2 when the ring element 4 is screwed onto the basic body 2.

An improvement in the strength of the screw connection results from a thinned wall region 29 of the ring element, disposed between the inside thread 25 and the contact surface 27 of the ring element 4 in the axial direction, which region does not have any inside thread, and which undergoes stretching when the ring element is screwed tightly onto the basic body 2. In this way, a

mechanical stress is exerted on the screw connection, thereby significantly increasing its strength.

Because of its plate-spring-like configuration, the sealing element 19 is deformed when the ring element 4 is screwed onto the basic body 2, thereby imparting a mechanical bias to it and causing it to exert a force onto the two piston parts 2, 4. In this way, a further improvement of the strength of the screw connection is obtained.

Furthermore, the mantle surface of the basic body 2 has a projection 30 directed radially outward, between the collar 16 and the cooling channel 22, which projection forms the recess 18 on the piston head side, and delimits the cooling channel 22 on its side that faces away from the piston head 3. The projection 30 has such a slight wall thickness that it is deformed when the ring element 4 is screwed onto the basic body 2, and thereby makes an additional contribution to securing the screw connection and preventing it from coming loose.

The basic body 2 is produced from aluminum, which is brought into the desired shape by means of forging. The ring element 4 is produced from Ni resist, using a casting method. Ni resist is an austenitic cast iron with 12% to 20% nickel, which furthermore contains the alloy components manganese, copper, and chrome. Ni

resist is particularly suitable for reinforcing piston ring grooves.

Fig. 2 shows an enlarged section through the edge region of the piston 1 on the piston head side, showing the basic body 2 with the ring element 4 screwed onto it. The recess 21 molded into the edge region of the piston head 3, which is covered by the ring element 4 consisting of Ni resist, in order to form the cooling channel 22, can be clearly seen, whereby the ring element 4 is screwed onto the outside thread 26 of the basic body 2 by way of the inside thread 25.

Reference Symbol List

1	piston
2	basic body
3	piston head
4	ring element
5	longitudinal axis
6	pin bore
7	combustion chamber
8	pin boss
9	skirt element
10	mantle surface
11	groove
12	lower face of the ring element 4
13	second ring groove
14	mantle surface
15	oil ring groove
16	collar
17	ring surface
18	recess
19	sealing element
20	recess
21	recess
22	cooling channel
23	interior of piston
24	oil channel

25 inside thread

26 outside thread

27 contact surface

28 contact surface

29 thinned wall region

30 projection